Hyomuk Kim

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Interests

Robotics, Navigation, Computer Vision, Machine Learning

Education

Chung-Ang University — Seoul, Republic of Korea
Undergraduate Student — *Mar 2007 – Feb 2011*

- Bachelor of Science in Electrical and Electronics Engineering
- Cadet in the Army ROTC 49^{th} program

Military Service

Reconnaissance Battalion, 60^{th} Div., Republic of Korea Army — Goyang, Republic of Korea
First Lieutenant, Head of Communication Platoon — *Mar 2011 – Jun 2013*

- Responsible for strategic operation of communication systems, managed and employed military radios, antennas and information assets and provided training to active-duty soldiers and reservists as a communication director.
- Received regular training of deep enemy territory operation, helicopter rappel, outdoor camping and marching.

Research Experiences

Robot Intelligence Team, Robot Center, Samsung Research — Seoul, Republic of Korea
Staff Software Engineer (Advisor: Junghyun Kwon) — *Apr 2021 – Present*

Project: **Autonomous Mobile Robot Navigation**

- Designed the architecture of visual SLAM module using ROS2 with C++ for our navigation suite and implemented ORB feature extractor and matcher for visual odometry and local bundle adjuster for optimization of local map.
- Experimented in indoor environments with mobile robot platform with visual SLAM mounted on and debugged a variety of matching and tracking issues, doing performance comparison evaluation with other algorithms.
- Examined LiDAR scan based Monte-Carlo localizer module and refactored motion model and measurement model by testing the module on various types of mobile robots and ensuring improved performance.
- Adjusted cost function of Dynamic Window Approach of forward motion planner according to the configurations of robots and tuned parameters to handle problematic situations that robots are faced with.

Global AI Center, Samsung Research — Seoul, Republic of Korea
Software Engineer (Advisor: Daniel D. Lee) — *Jan 2020 – Apr 2021*

Project: **Brain-Machine Interface**

- Implemented speech imagery recognition engine using EEG data and hand gesture recognition engine using EMG data as prototypes with OpenBCI boards and sensors, by collecting data following appropriate paradigms and protocols, training CNN models to extract features and testing the system with testers for evaluation.

Project: **Voice Command Recommendation for AI Assistant Users**

- Developed an Android app that suggests voice commands that users can employ, by analyzing AI assistant's planning rules and implementing an algorithm to discern the context of mobile phone usage in real-time logs, which utilizes TF-IDF to identify patterns from interactions involving touch interfaces and voice commands.

Language & Voice Team, Global AI Center, Samsung Research — Seoul, Republic of Korea
Software Engineer (Advisor: Chanwoo Kim) — *Apr 2018 – Jan 2020*

Project: **Neural Speech Synthesis**

- Implemented and benchmarked collaboratively deep generative models such as WaveNet and LPCNet, and trained them with a variety of speech dataset by changing and analyzing hyperparameters to get the best performance.
- Experienced the whole process of deploying a proprietary deep learning model for AI voice service, which includes collecting and preprocessing raw data, developing models as stated above, optimizing them by porting to C with intrinsic functions and assessing the models by MOS(Mean Opinion Score) test using AWS MTurk.
- Made contributions for commercialization of an efficient Neural TTS engine into mobile devices.

Professional Experiences

TV R&D Lab., Visual Display Div., Samsung Electronics — Suwon, Republic of Korea
Hardware Engineer — *Apr 2013 – Apr 2018*

- Participated in projects on commercialization of TV flagship products annually released.
- Measured and analyzed elements of picture/sound quality, electro-magnetic interference (EMI), wireless connection (Wi-Fi/Bluetooth), DC power sequence and device compatibility to troubleshoot problems of TV system.
- Reviewed layouts of product components, managed circuitry modifications, applied design changes on CAD program and coped with diverse tasks for production of PCBs and overall bring-up process.

C-Lab., Visual Display Div., Samsung Electronics — Suwon, Republic of Korea
Project Leader — *Jun 2014 – Jun 2015*

- Led a project (made up of 6 members) on implementation of user contents archive application on TV system.
- Concretized service concept, designed information architecture and graphical user interface and realized flexible user experience for sharing user contents between multi devices or broadcasting them between users via a channel.

Patents

[1] Boseong Jeon, **Hyomuk Kim**.
Motion Generation Method for Active Screen Extension by Multiple Movable Projectors. *Application In Process, Oct 2023.*

[2] **Hyomuk Kim**, Woojeong Kim, Jewoong Ryu, Mideum Choi, Aron Baik.
Robot Device Operating In A Mode Corresponding To A Position Of The Robot Device And Control Method Thereof. *US18/236064, Aug 2023.*

[3] Woojeong Kim, Haeyeon Gim, **Hyomuk Kim**, Keunchan Oh.
Robot Cleaner and Cleaning Method Thereof. *KR10-2023-0106202, Aug 2023.*
- Method for Improving Coverage Rate of Cleaning Robots by Moving Them.

[4] Eunsoll Chang, Youngil Koh, **Hyomuk Kim**, Mideum Choi.
Movable Robot And Controlling Method Thereof. *US18/142928, May 2023.*
- Method for Reducing Redundant Directional Decisions to Enhance Obstacle Avoidance in Mobile Robots.

[5] **Hyomuk Kim**, Aron Baik.
Robot, Robot System And Controlling Method Thereof. *WO2023063565A1, Apr 2023.*
- Robot System as a Mothership and Controller of Microbots.

[6] Mideum Choi, **Hyomuk Kim**, Jewoong Ryu, Aron Baik.
Electronic Device And Control Method Therefor. *WO2023043075A1 (filed to US Patent), Mar 2023.*
- Method of Yield Planning for Mobile Robots.

[7] Soonbeom Kwon, Aron Baik, Dohoon Kim, **Hyomuk Kim**, Hyunki Hong.
Robot And Control Method Thereof. *WO2023003158A1, Jan 2023.*
- Real-Time Minimum-Time Path Planning with Obstacle Information Incorporation.

[8] Keunseok Cho, Dongseop Lee, **Hyomuk Kim**, Yusun Son, Dojun Yang, Ziwon Hyung.
Electronic Device And Control Method Therefor. *WO2022186580A1, Sep 2022.*
- Method and Apparatus for Optimizing Environment and Content Based Brainwave Signal Recognition.

[9] Dongseop Lee, Ziwon Hyung, **Hyomuk Kim**, Dojun Yang, Keunseok Cho.
Electronic Device And Control Method Therefor. *WO2022080659A1, Apr 2022.*
- Method for Auto-Verification of AI Assistant's Capability.

[10] Dongseop Lee, **Hyomuk Kim.**
Electronic Device And Control Method Therefor. *WO2022050644A1, Mar 2022.*
- Method for Anthropometry-Based Personalized Posture Correction.

[11] **Hyomuk Kim**, Seongjin Park, Soyoon Eo, Seungyeon Jeong, Yeonseok Choi, Taehun Kang, Hyejeong Lee, Kwanmin Lee.
Display Apparatus And Control Method Thereof. *US20170026528A1, Jan 2017.*
- Method and Apparatus of Forming Digital Albums Based on Display Unit.

Courses

Nanodegree in Robotics Software Engineer, Udacity — *Online*
Certificate — *Sep 2021 – Dec 2021*

The Complete Self-Driving Car Course - Applied Deep Learning, Udemy — *Online*
Certificate — *Jan 2022 – Mar 2022*

Beginning C++ Programming - From Beginner to Beyond, Udemy — *Online*
Certificate — *Apr 2022 – Jun 2022*

Skills

Languages: Korean (Native), English (Fluent)

Programming: C/C++, Python

Technologies: Linux, ROS/ROS2, OpenCV, Eigen, Ceres, Tensorflow, PyTorch, Keras, Git, LaTeX

Awards & Honors

Super Rookie Project Award, Ranked 2^{nd} Prize, Samsung Electronics — *Apr 2014*

- For presenting an outstanding TV service concept of user contents archive platform with flexible interfaces.
- With this prize, my team got a chance to work on the project in C-Lab. (great honor for rookies!)

Volunteer Scholarship, Chung-Ang University — *Spring 2009*

Special Scholarship, Chung-Ang University — *Fall 2009*

Chung-Ang Love Scholarship, Chung-Ang University — *Spring 2009, Fall 2009, Spring 2010*

Volunteer Experiences

Seoul Peaceful House — Seoul, Republic of Korea
Volunteer — *Jun 2012 – Jan 2013*

- Volunteered 40 hours over 18 occasions at this local government-affiliated organization.
- Supported individuals with disabilities by assisting with meals, laundry, cleaning, outings, and social activities.

Extracurricular Activities

SASSE (in-company strings club) — Seoul, Republic of Korea
Cellist — *Apr 2018 – Present*

- Played cello for regular performances in the lobby as a chamber orchestra or a cello quartet.

Samsung Digital Philharmonic Orchestra — Suwon, Republic of Korea
Cellist — *Apr 2015 – Apr 2018*

- Participated in the 4^{th} regular concert at Samsung Electronics Leadership Center Concert Hall.